CESAR LATTES, the Discovery of Meson π and the 1950 Nobel Prize in Physics.

Prof.Dr.M.S.D.Cattani (Full Professor Senior at IFUSP)
Prof.Dr.J.M.F.Bassalo (Full Professor of the Department of Physics at UFPa)
M.Cattani (mcattani@if.usp.br) and JMFBassalo (jmfbassalo@gmail.com)

Prof.M.Cattani, in 1964, after finishing his bachelor's degree in Physics from the Faculty of Philosophy, Sciences and Letters of the University of S. Paulo (FFCLUSP) was hired as an assistant to Prof. Cesar Lattes. He was the Regent of the Superior Physics Chair of the USP Department of Physics who belonged to FFCLUSP. Cattani, during the physics course, heard that Lattes along with Professors G. Occhialini and C.F.Powell had discovered the π meson using nuclear emulsions and that only Powell had been awarded the Nobel Prize in Physics (PNF) in 1950. Not being familiar with this award, he found it a great injustice. For many years he heard from various colleagues the most varied explanations for this fact. He never had the courage to ask Lattes directly why this had happened.

Many years later, in October 1982, Occhialini came to S. Paulo to give a colloquium at IFUSP. Cattani and the Prof. Normando C. Fernandes picked him up from Congonhas airport. He was staying in Rio de Janeiro (at an invitation of the Brazilian Academy of Sciences) and would arrive by the Rio−S.Paulo air bridge. Cattani didn't know Occhialini, but Normando said he did. They waited for him to arrive at the arrivals area of Congonhas. Several flights arrived, many passengers passed them in the lobby. Normando was smoking, as usual, and several times passed them, coming and going, an "old man" with a knapsack on his back. He must have tired of coming and going and finally decided to come over and order a cigarette for Normando. He thanked the cigarette and curiously asked if we were from IF. Conclusion, he said that he was the Occhialini that Normando claimed to know very well. Shortening the story, they took the Normando's car and went to the IF.

During his time at IFUSP before the colloquium, Cattani talked to him for a long time. He seized the occasion and touched on the 1950 Nobel Prize (PNF) issue. He then said that in his life he had two hurts. The

first is that he did not receive the NPF in 1948 for the work that was done in England by him and Prof.P.M.S.Blackett. The justification given was that he was the "student" and Blackett was the "teacher." The second time in 1950 when Powell alone won the NPF. The justification given was that Powell won because he was the leader of the Bristol Group in England, where Occhialini and Lattes were visitors. But he smiled and told Cattani that he believed the reason was different: **“As England had won the war and Italy had lost the war, the Italian was excluded. Lattes was excluded because it was Brazilian, from the "third world".**

Looking at the PNF records,[1] one can see that the official justification for Powell's 1950 PNF award was:

"for the development of the photographic method of studying nuclear processes and their discoveries about the mesons with this method."

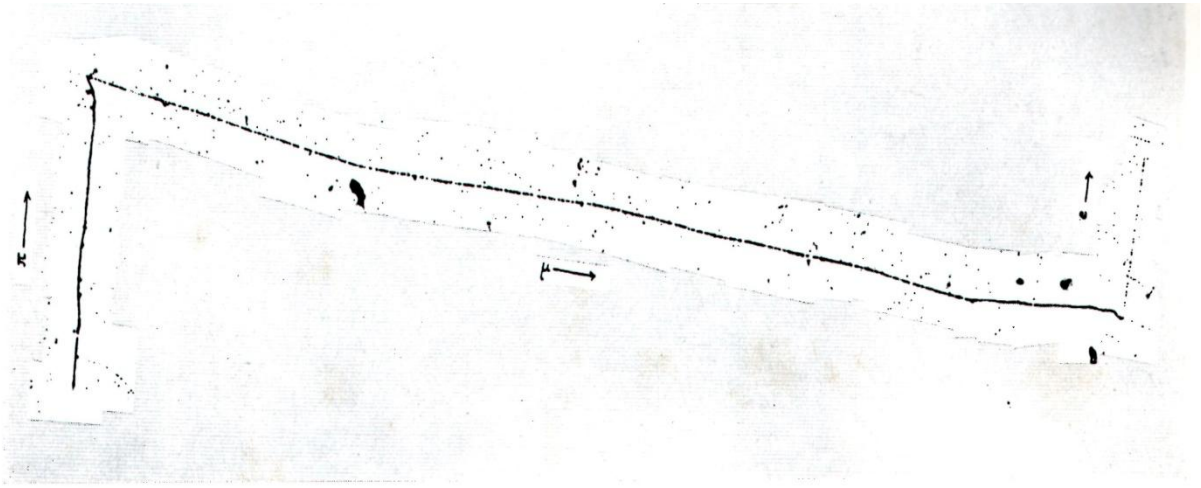
Let us understand the reason for Occhialini's scathing criticism by analyzing the sequence of facts that led to the discovery of meson π. It is important to note that the nuclear emulsion technique first began to be employed in 1912 by the Japanese physicist S. Kinoshita that was later perfected in 1937 by Austrian physicists M. Blau and H. Wambacher.[2].

Lattes told Cattani that he and Occhialini went to Bristol to use English emulsions because English cows produced the best "mocotó" in the world, which was great for making emulsions. Lattes arrived in Bristol in 1945 where he began work, together with Occhialini, in collaboration with researchers from the Powell-led Bristol Group.

Let us now return to Cattani's conversation with Occhialini in São Paulo in 1982. He said that although the English emulsions were very good they were not sensitive enough to detect some types of traces and, mainly, could not stabilize the traces for long periods generated by the ionizing particles. Using these emulsions Lattes published articles in collaboration with Fowler and Cuer in 1947.[3]

To increase the sensitivity of emulsions and the fixation time of traces Occhialini stated that Lattes had the idea to prepare emulsions treated with "borax" (boron-containing compound), following the recipe of an English chemist Johnny Williamson of Dep. Chemistry of the University of Bristol. As the Bristol Group was conducting research in the Pyrenees, Lattes suggested to Occhialini that he take borax-treated

emulsions to test their efficiency when subjected to cosmic rays in the" Pic du Midi". These new emulsions brought by Occhialini, unveiled in January 1947 showed two “unusual events", that is, “unusual traits” that they called “double mesons.” The discovery of these events was published in the name of Lattes, Powell, Occhialini, and Muirhead in 1947.[4] Below is shown the picture of an emulsion plate with a "double meson" [see "Atomic Physics" - Max Born (Blackie & Son Limited, 1959, p.52)].



Ch. II, Fig. 17.—A primary π-meson decays into a μ-meson and an invisible (neutral) particle. The direction of the μ-meson is seen from the increase of the number of black grains; the ionizing power of slow particles is greater than that of fast ones. The μ-meson finally disintegrates into an electron and an invisible particle.
The picture is a mosaic of micro-photographs of short sections of the tracks taken with different focus (see pp. 36, 52).

As were found only few "double mesons" Lattes decided to take the new emulsions to Mount Chacaltaya in Bolivia which is 5,500 m high. Back to Bristol, Lattes with Powell and Occhialini found on the plates displayed at Chacaltaya about 30 "double mesons". With these events they calculated the masses of these mesons. These results have been published two articles in 1947[5,6] in the name of Powell, Lattes and Occhialini. In these articles they identified the **primary meson** or **meson π**, having mass $m_\pi = (260 \pm 30)m_e$ and the secondary meson μ, with mass $m_\mu = (205 \pm 20)$ m_e, which had already been discovered in 1937.

In 1948 Lattes went to Berkeley, where in collaboration with Prof. Eugene Gardner, using a particle accelerator were generated in 1949,[7] the π^+ and π^- and obtained the first evidences of π^o.

The discovery of the meson π had worldwide repercussions and the Nobel Committee (said by Lattes) thought of attributing the 1950 NPF to Powell, Lattes and Gardner. However, with Gardner's untimely death, the 1950 NPF was attributed only to Prof. Cecil Frank Powell. We end the

article by quoting Occhialini's critical justification for explaining why the 1950 pop was attributed only to Powell: **"come l'Inghilterra aveva vinto la guerra e l'Italia aveva perso la guerra, l'italiano è stato escluso. Lattes fu escluso perché era brasiliano, dal "terzo mondo".**

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